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Data for computing the Positions of the Satellites of Jupiter, 1895–96. By A. Marth.

The following data for computing the places of the satellites for the present apparition of *Jupiter* are a continuation of those for the four preceding apparitions published in the *Monthly Notices.* They furnish, at intervals of ten days, the mean longitudes l of the satellites and the arguments of their inequalities. The motions of the longitudes and arguments during the intervals, and the inequalities corresponding to the arguments are to be found on pp. 524–539 of vol. li.

The inclinations γ and the longitudes of the nodes Γ of the planes of the orbits referred to the plane of *Jupiter's* equator are the following :—

		Sat. I.		Sat. II.		Sat. III.		Sat. IV.	
		γ_1	$O-\Gamma_1$	γ_2	$O-\Gamma_2$	γ_3	$O-\Gamma_3$	γ_4	$O-\Gamma_4$
1895. Aug.	24	0°·0099	169°·3	0°·4832	167°·93	0°·1256	129°·58	0°·3389	28°·63
Sept.	23	99	170·7	·4830	168·92	·1257	129·78	·3386	28·68
Oct.	23	99	172·1	·4828	169·92	·1258	129·98	·3383	28·75
Nov.	22	99	173·5	·4826	170·91	·1259	130·17	·3381	28·81
Dec.	22	99	174·9	·4825	171·90	·1259	130·35	·3379	28·88
1896 Jan.	21	0·0099	176·3	0·4823	172·88	0·1260	130·53	0·3378	28·95
Feb.	20	99	177·7	·4821	173·86	·1261	130·71	·3377	29·02
Mar.	21	98	179·0	·4819	174·83	·1262	130·88	·3376	29·09
Apr.	20	98	180·4	·4817	175·80	·1262	131·04	·3376	29·16
May	20	98	181·7	·4816	176·76	·1263	131·20	·3376	29·24
June	19	0·0098	183·0	0·4814	177·71	0·1264	131·35	0·3377	29·32

In a "Note on the Determination of the Planes of the Orbits of *Jupiter's* Satellites," published in vol. xliv. p. 241 ff., it was pointed out that the most promising means for determining the longitudes of the nodes of the orbits with accuracy would be found in micrometrical measurements of the rectangular coordinates of the shadows of the satellites near their midtransits, if these measurements are made about the times when the planes of the orbits pass through the Sun. Though the opportunities of 1884, and at the next nodal passages in 1890, pointed out in vol. l. p. 347, appear to have been neglected, observers ought to be reminded of their opportunities offered during the present apparition of *Jupiter.* The nodal passages occur, indeed, too late in the season to allow corresponding observations to be made on both sides of the centre, and when *Jupiter* becomes accessible again after the conjunction with the Sun, the shadows will cross at greater distances from the centre. After another revolution of *Jupiter*, in 1908, the circumstances will be rather more favourable, but the best opportunities for getting corresponding observations before and after the nodal passages will only present themselves during the oppositions of 1920 and 1932. But, at the opposite node, the most favourable opportunities during *Jupiter's* 83 years' cycle will offer themselves in 1902 and 1914, and,

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though *Jupiter* will then have considerable southern declination, it is to be hoped the opportunities will not again be neglected. At present it is unknown what degree of accuracy is attainable in measuring the co-ordinates of the shadows. It would be mere waste of labour to give accurate predictions, but I am willing to compute the measures of the shadows made during the present apparition, if they are published or communicated in time.

The rectangular co-ordinates of the satellites referred to the axes of the disc of *Jupiter* are found by means of the formulæ (*v.* vol. li. p. 506) :

$$\Delta' = \Delta + a\rho \cos B \,.\, \cos (v - L)$$

$$x = \frac{a''}{\Delta'} \,.\, \rho \,.\, \sin (v - L)$$

$$y = \frac{a''}{\Delta'} \,.\, \rho \left(\cos (v - L) \sin B + \sin \gamma \cos B \,.\, \sin (v - \Gamma)\right).$$

The values of the distance Δ of *Jupiter* from the Earth and of L and B are to be interpolated for the times t, for which the positions are required, but those of l and of the arguments on which the true longitudes v and the rad. vect. ρ depend, for the times $t - \tau$, if τ is the light-time given in the ephemeris for physical observations.

As there will be an occultation of *Jupiter's* system by the Moon on June 14, I have computed the positions of the satellites and give here the results :

1896 June 14.	Sat. I. x_1	Sat. I. y_1	Sat. II. x_2	Sat. II. y_2	Sat. III. x_3	Sat. III. y_3	Sat. IV. x_4	Sat. IV. y_4
h m	"	"	"	"	"	"	"	"
9 0 Gr.	+96·18	+0·03	+124·55	−1·71	+202·68	+0·82	−425·44	−2·81
9 30	96·50	−0·01	121·14	1·71	205·15	0·79	426·01	2·78
10 0	96·29	0·05	117·58	1·72	207·55	0·76	426·55	2·75
10 30	95·54	0·09	113·87	1·72	209·88	0·73	427·07	2·72
11 0	+94·27	−0·13	+110·00	−1·71	+212·15	+0·69	−427·56	−2·70

To convert these co-ordinates into differences of right ascension and declination, we have

$$s \sin (p - P) = x \qquad 15 \cos \delta\, (\alpha - A) = s \sin p$$
$$s \cos (p - P) = y \qquad \delta - D = s \cos p$$

Hence

	$\alpha_1 - A$	$\delta_1 - D$	$\alpha_2 - A$	$\delta_2 - D$	$\alpha_3 - A$	$\delta_3 - A$	$\alpha_4 - A$	$\delta_4 - A$
h m	s	"	s	"	s	"	s	"
9 0 Gr.	+6·488	−27·89	+8·270	−37·80	+13·688	−58·06	−28·762	+120·82
9 30	6·508	28·03	8·137	36·81	13·854	58·81	28·799	121·03
10 0	6·493	28·02	7·896	35·78	14·015	59·54	28·834	121·22
10 30	6·443	27·84	7·645	34·71	14·171	60·25	28·868	121·40
11 0	+6·356	−27·51	+7·384	−33·58	+14·323	−60·95	−28·901	+121·58

The values of the mean distances of the satellites here assumed are those corresponding to the mass of *Jupiter's* system 1 : 1047·7. If it is preferred to adopt another mass, all these numbers must be multiplied by a factor, the logarithm of which may be inferred from the values in vol. li. p. 516.

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First Satellite.

Greenwich Noon.	Longitude.		Arguments.				
	$l_1 - 0$	S_1	α_1	β_1	γ_1	δ_1	ϵ_1
1895.	°	°					
Aug. 24	99·5680	+ ·0014	·2296	·807	·033	·677	·197
Sept. 3	334·4575	13	·9026	·226	·681	·330	·222
13	209·3471	13	·5757	·644	·329	·982	·246
23	84·2366	12	·2487	·062	·978	·634	·271
Oct. 3	319·1262	11	·9217	·480	·626	·287	·296
13	194·0158	10	·5947	·899	·274	·939	·320
23	68·9053	+ ·0010	·2677	·317	·923	·591	·345
Nov. 2	303·7949	09	·9407	·735	·571	·243	·370
12	178·6844	08	·6137	·153	·219	·896	·395
22	53·5740	07	·2867	·572	·868	·548	·419
Dec. 2	288·4636	07	·9598	·990	·516	·200	·444
12	163·3531	06	·6328	·408	·164	·852	·469
22	38·2427	+ ·0005	·3058	·826	·812	·505	·493
1896.							
Jan. 1	273·1322	05	·9788	·245	·461	·157	·518
11	148·0218	04	·6518	·663	·109	·809	·543
21	22·9114	03	·3248	·081	·757	·461	·567
31	257·8009	02	·9978	·499	·406	·114	·592
Feb. 10	132·6905	02	·6708	·918	·054	·766	·617
20	7·5800	+ ·0001	·3439	·336	·702	·418	·641
Mar. 1	242·4696	+ ·0000	·0169	·754	·351	·071	·666
11	117·3592	− ·0000	·6899	·172	·999	·723	·691
21	352·2487	01	·3629	·591	·647	·375	·715
31	227·1383	02	·0359	·009	·296	·027	·740
Apr. 10	102·0278	03	·7089	·427	944	·680	·765
20	336·9174	− ·0003	·3819	·845	·592	·332	·790
30	211·8070	04	·0549	·264	·241	·984	·814
May 10	86·6965	05	·7280	·682	·889	·636	·839
20	321·5861	06	·4010	·100	·537	·289	·864
30	196·4756	06	·0740	·518	·186	·941	·888
June 9	71·3652	07	·7470	·937	·834	·593	·913
19	306·2548	− ·0008	·4200	·355	·482	·246	·938
29	181·1443	08	·0930	·773	·131	·898	·962

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Greenwich Noon.	*First Satellite.* Arguments. ζ_1	η_1	θ_1	*Second Satellite.* Longitude. l_2-O	S_2	Arguments. α_2	β_2
1895. Aug. 24	·752	·052	·869	° 58·2345	° −·0089	·61482	·807
Sept. 3	·773	·073	·889	351·9818	89	·45132	·226
13	·795	·094	·910	285·7290	89	·28783	·644
23	·817	·114	·930	219·4763	89	·12433	·062
Oct. 3	·839	·135	·951	153·2235	89	·96084	·480
13	·860	·156	·972	86·9708	89	·79735	·899
23	·882	·177	·992	20·7180	−·0089	·63385	·317
Nov. 2	·904	·197	·013	314·4653	89	·47036	·735
12	·926	·218	·033	248·2125	89	·30687	·153
22	·947	·239	·054	181·9598	89	·14337	·572
Dec. 2	·969	·260	·074	115·7071	89	·97988	·990
12	·991	·280	·095	49·4543	89	·81639	·408
22	·013	·301	·116	343·2016	−·0089	·65289	·826
1896. Jan. 1	·034	·322	·136	276·9488	89	·48940	·245
11	·056	·343	·157	210·6961	89	·32590	·663
21	·078	·363	·177	144·4433	89	·16241	·081
31	·100	·384	·198	78·1906	89	·99892	·499
Feb. 10	·121	·405	·219	11·9378	89	·83542	·918
20	·143	·426	·239	305·6851	−·0088	·67193	·336
Mar. 1	·165	·446	·260	239·4324	88	·50844	·754
11	·187	·467	·280	173·1796	88	·34494	·172
21	·208	·488	·301	106·9269	88	·18145	·591
31	·230	·509	·322	40·6741	87	·01796	·009
Apr. 10	·252	·529	·342	334·4214	87	·85446	·427
20	·274	·550	·363	268·1686	−·0087	·69097	·845
30	·295	·571	·383	201·9159	86	·52748	·264
May 10	·317	·591	·404	135·6632	86	·36398	·682
20	·339	·612	·425	69·4104	86	·20049	·100
30	·361	·633	·445	3·1577	85	·03699	·518
June 9	·382	·654	·466	296·9049	85	·87350	·937
19	·404	·674	·486	230·6522	−·0084	·71001	·355
29	·426	·695	·507	164·3994	84	·54651	·773

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Second Satellite.

Greenwich Noon.	Arguments.								
	γ_2	δ_2	ϵ_2	ζ_2	η_2	θ_2	ι_2	κ_2	λ_2
1895.									
Aug. 24	·863	·563	·746	·752	·552	·369	·697	·667	·483
Sept. 3	·678	·378	·562	·773	·573	·389	·722	·524	·340
13	·493	·194	·378	·795	·594	·410	·746	·382	·198
23	·307	·010	·194	·817	·614	·430	·771	·239	·055
Oct. 3	·122	·826	·010	·839	·635	·451	·796	·096	·912
13	·937	·641	·826	·860	·656	·472	·820	·953	·769
23	·752	·457	·642	·882	·677	·492	·845	·811	·626
Nov. 2	·566	·273	·458	·904	·697	·513	·870	·668	·483
12	·381	·089	·274	·926	.718	·533	·895	·525	·340
22	·196	·904	·089	·947	·739	·554	·919	·382	·197
Dec. 2	·011	·720	·905	·969	·760	·574	·944	·239	·054
12	·826	·536	·721	·991	·780	·595	·969	·097	·911
22	·640	·352	·537	·013	·801	·616	·993	·954	·769
1896.									
Jan. 1	·455	·168	·353	·034	·822	·636	·018	·811	·626
11	·270	·983	·169	·056	·843	·657	·043	·668	·483
21	·085	·799	·985	·078	·863	·677	·067	·526	·340
31	·899	·615	·801	·100	·884	·698	·092	·383	·197
Feb. 10	·714	·431	·617	·121	·905	·719	·117	·240	·054
20	·529	·246	·433	·143	·926	·739	·141	·097	·911
Mar. 1	·344	·362	·249	·165	·946	·760	·166	·955	·768
11	·158	·878	·064	·187	·967	·780	·191	·812	·625
21	·973	·694	·880	·208	·988	·801	·215	·669	·483
31	·788	·509	·696	·230	·009	·822	·240	·526	·340
Apr. 10	·603	·325	·512	·252	·029	·842	·265	·384	·197
20	·417	·141	·328	·274	·050	·863	·290	·241	·054
30	·232	·957	·144	·295	·071	·883	·314	·098	·911
May 10	·047	·772	·960	·317	·091	·904	·339	·955	·768
20	·862	·588	·776	·339	·112	·925	·364	·813	·625
30	·676	·404	·592	·361	·133	·945	·388	·670	·482
June 9	·491	·220	·408	·382	·154	·966	·413	·527	·339
19	·306	·036	·224	·404	·174	·986	·438	·384	·196
29	·121	·851	·039	·426	·195	·007	·462	·242	·054

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Third Satellite.

Greenwich Noon.		Longitude.		Arguments.				
		$l_3 - \odot$	S_3	α_3	β_3	γ_3	δ_3	ϵ_3
1895.		°	°					
Aug.	24	307·5678	−·0116	·2552	·4389	·8074	·352	·860
Sept.	3	90·7439	·0116	·6527	·8365	·2257	·150	·299
	13	233·9200	·0116	·0502	·2342	·6439	·949	·738
	23	17·0961	·0115	·4477	·6318	·0622	·747	·177
Oct.	3	160·2722	·0115	·8453	·0295	·4804	·546	·616
	13	303·4483	·0115	·2428	·4272	·8987	·344	·055
	23	86·6244	−·0115	·6403	·8248	·3169	·143	·494
Nov.	2	229·8005	·0115	·0378	·2225	·7352	·941	·933
	12	12·9766	·0114	·4353	·6201	·1534	·740	·372
	22	156·1527	·0114	·8328	·0179	·5717	·538	·811
Dec.	2	299·3288	·0114	·2303	·4154	·9899	·337	·250
	12	82·5049	·0114	·6278	·8131	·4082	·135	·689
	22	225·6810	−·0113	·0253	·2108	·8264	·933	·128
1896.								
Jan.	1	8·8571	·0113	·4229	·6084	·2447	·732	·567
	11	152·0332	·0112	·8204	·0061	·6630	·531	·006
	21	295·2093	·0112	·2179	·4037	·0812	·329	·445
	31	78·3854	·0111	·6154	·8014	·4995	·128	·884
Feb.	10	221·5615	·0111	·0129	·1990	·9177	·926	·323
	20	4·7376	−·0110	·4104	·5967	·3360	·725	·762
Mar.	1	147·9137	·0110	·8079	·9944	·7542	·524	·201
	11	291·0898	·0109	·2054	·3920	·1725	·322	·640
	21	74·2659	·0109	·6029	·7897	·5907	·121	·079
	31	217·4421	·0108	·0005	·1873	·0090	·919	·517
Apr.	10	0·6182	·0107	·3980	·5850	·4272	·718	·956
	20	143·7943	−·0107	·7955	·9826	·8455	·516	·395
	30	286·9704	·0106	·1930	·3803	·2637	·315	·834
May	10	70·1465	·0105	·5905	·7780	·6820	·113	·273
	20	213·3226	·0105	·9880	·1756	·1002	·912	·712
	30	356·4987	·0104	·3855	·5733	·5185	·710	·151
June	9	139·6748	·0103	·7830	·9709	·9368	·509	·590
	19	282·8509	−·0102	·1805	·3686	·3550	·307	·029
	29	66·0270	·0101	·5781	·7662	·7733	·106	·468

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Greenwich Noon.		*Third Satellite.* Arguments. ζ_3	η_3	θ_3	ι_3	*Fourth Satellite.* Longitude. l_4-O	S_4	Arg. α_4
1895.								
Aug.	24	·752	·052	·869	·056	0°·9428	−°·0359	·58714
Sept.	3	·773	·073	·889	·452	216·6536	·0359	·18628
	13	·795	·094	·910	·849	72·3643	·0358	·78542
	23	·817	·114	·930	·245	288·0751	·0358	·38457
Oct.	3	·839	·135	·951	·642	143·7858	·0357	·98371
	13	·860	·156	·972	·038	359·4965	·0357	·58285
	23	·882	·177	·992	·435	215·2073	−·0356	·18199
Nov.	2	·904	·197	·013	·831	70·9180	·0356	·78113
	12	·926	·218	·033	·228	286·6288	·0355	·38028
	22	·947	·239	·054	·624	142·3395	·0354	·97942
Dec.	2	·969	·260	·074	·021	358·0502	·0353	·57856
	12	·991	·280	·095	·417	213·7610	·0352	·17770
	22	·013	·301	·116	·814	69·4717	−·0351	·77684
1896.								
Jan.	1	·034	·322	·136	·210	285·1825	·0350	·37599
	11	·056	·343	·157	·607	140·8932	·0349	·97513
	21	·078	·363	·177	·003	356·6039	·0348	·57427
	31	·100	·384	·198	·400	212·3147	·0346	·17341
Feb.	10	·121	·405	·219	·796	68·0254	·0345	·77255
	20	·143	·426	·239	·193	283·7362	−·0344	·37170
Mar.	1	·165	·446	·260	·589	139·4469	·0342	·97084
	11	·187	·467	·280	·986	355·1576	·0341	·56998
	21	·208	·488	·301	·382	210·8684	·0339	·16912
	31	·230	·509	·322	·779	66·5791	·0337	·76826
Apr.	10	·252	·529	·342	·175	282·2899	·0336	·36741
	20	·274	·550	·363	·572	138·0006	−·0334	·96655
	30	·295	·571	·383	·968	353·7113	·0332	·56569
May	10	·317	·591	·404	·365	209·4221	·0330	·16483
	20	·339	·612	·425	·761	65·1328	·0328	·76397
	30	·361	·633	·445	·158	280·8436	·0326	·36312
June	9	·382	·654	·466	·554	136·5543	·0324	·96226
	19	·404	·674	·486	·951	352·2650	−·0322	·56140
	29	·426	·695	·507	·347	207·9758	·0320	·16054

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Fourth Satellite.

Arguments.

	β_4	γ_4	δ_4	ϵ_4	ζ_4	η_4	θ_4
1895.							
Aug. 24	·352	·903	·581	·168	·265	·159	·948
Sept. 3	·150	·502	·175	·362	·464	·376	·148
13	·949	·101	·770	·555	·663	·593	·347
23	·747	·700	·365	·749	·863	·809	·547
Oct. 3	·546	·299	·959	·943	·062	·026	·746
13	·344	·898	·554	·137	·261	·243	·946
23	·143	·497	·148	·330	·461	·460	·145
Nov. 2	·941	·096	·743	·524	·660	·677	·345
12	·740	·695	·338	·719	·860	·893	·544
22	·538	·294	·932	·912	·059	·110	·744
Dec. 2	·337	·893	·527	·106	·258	·327	·943
12	·135	·492	·122	·299	·458	·544	·143
22	·933	·091	·716	·493	·657	·760	·342
1896.							
Jan. 1	·732	·690	·311	·686	·856	·977	·542
11	·531	·289	·906	·881	·056	·194	·742
21	·329	·888	·500	·074	·255	·411	·941
31	·128	·487	·095	·268	·455	·627	·141
Feb. 10	·926	·086	·689	·462	·654	·844	·340
20	·725	·685	·284	·656	·853	·061	·540
Mar. 1	·524	·284	·879	·850	·053	·278	·739
11	·322	·883	·473	·043	·252	·495	·939
21	·121	·482	·068	·237	·451	·711	·138
31	·919	·081	·663	·431	·651	·928	·338
Apr. 10	·718	·680	·257	·625	·850	·145	·537
20	·516	·279	·852	·818	·050	·362	·737
30	·315	·878	·446	·012	·249	·578	·936
May 10	·113	·477	·041	·206	·448	·795	·136
20	·912	·076	·636	·400	·648	·012	·335
30	·710	·675	·230	·594	·847	·229	·535
June 9	·509	·274	·825	·787	·046	·445	·734
19	·307	·873	·420	·981	·246	·662	·934
29	·106	·472	·609	·175	·445	·879	·133

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Errata in Mr. Innes's Paper.

Page 313, 2nd last line, *after* stars *add* near.

,, 314, 9th line, *delete* The brightest star in finder S. of η Pavonis.

,, 314, 19th line, *delete* full stop after "it."

,, 315, 12th line, *for* 71" *read* > 1".

Errata in Mr. Knobel's Paper.

Page 434, *for* Batina *read* Batiya.

,, 437, *delete* last sentence of note to Star 61.